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कास्टर और व्हील — 1.1 मी./से. (4 कि.मी./घंटा) से अधिक और 4.4 मी./से. (16 कि.मी./घंटा) तक के अनुप्रयोग की अपेक्षाएँ

Indian Standard

CASTORS AND WHEELS — REQUIREMENTS FOR APPLICATIONS OVER 1.1 m/s (4 km/h) AND UP TO 4.4 m/s (16 km/h)

ICS 53.060

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NEW DELHI 110002

March 2009 **Price Group 7**

Material Handling Systems and Equipment Sectional Committee, MED 07

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 22884 : 2004 'Castors and wheels — Requirements for applications over 1,1 m/s (4 km/h) and up to 4,4 m/s (16 km/h)'.issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Material Handling Systems and Equipment Sectional Committee and approval of the Mechanical Engineering Division Council.

This standard supersedes IS 7261 : 1985 'Dimensions for aero slides'.

The text of the ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to the following International Standard for which Indian Standard also exists. The corresponding Indian Standard which is to be substituted in its place is listed below along with its degree of equivalence for the edition indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 22877 : 2004 Castors and wheels — Vocabulary, symbols and multilingual terminology	IS/ISO 22877 : 2004 Castors and wheels — Vocabulary, symbols and multilingual terminology	Identical

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 22878 : 2004	Castors and wheels — Test methods and apparatus

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CASTORS AND WHEELS — REQUIREMENTS FOR APPLICATIONS OVER 1.1 m/s (4 km/h) AND UP TO 4.4 m/s (16 km/h)

1 Scope

This International Standard specifies the technical requirements, the appropriate dimensions and the requirements for testing of castors and wheels (which may include accessories), specifically for manually propelled or power-towed industrial applications at speeds over 1,1 m/s (4 km/h) and up to 4,4 m/s (16 km/h).

Pneumatic wheels and drive wheels are not covered by this International Standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22877, *Castors and wheels — Vocabulary, symbols and multilingual terminology*

ISO 22878:2004, *Castors and wheels — Test methods and apparatus*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22877 apply. Symbols are given in ISO 22878:2004, Annex A.

4 Classification, characteristics and dimensions

4.1 Classification

The castors and wheels are divided into three categories: A, B and C. These categories define three increasing speed ratings and are listed in Table 1.

Table 1

Category	A	B	C
Speed, m/s (km/h)	1,7 (6)	2,8 (10)	4,4 (16)

4.2 Characteristics

The characteristics of a castor are

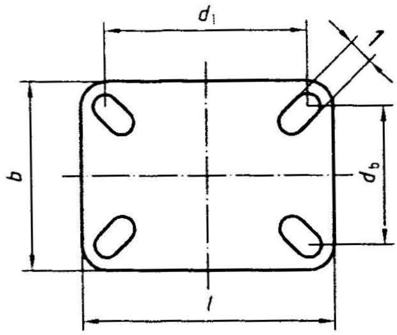
- top plate,
- offset,
- wheel, and
- load capacity.

4.3 Top plate

Rectangular top plates are used with four fixing holes. The design of the outer profile is left to the manufacturer, provided that it is inscribed in a rectangle of maximum size $l \times b$ as indicated in Table 2 and shown in Figure 1.

The fixing holes are located at the corners of a rectangle inscribed in the outer profile. The holes may be oblong and form slots, provided the width of the slot is suitable for bolts of diameter (D_{G1}) as in Table 2.

Table 2 lists the standardized dimensions of the different classes of top plates.



Key

1 adapted to D_{G1}

NOTE The symbols $A \times B$ (top plate outer dimensions) and $a \times b$ (bolt hole spacing) may be used in place of the recommended symbols stated above as these are of common use within the trade.

Figure 1 — Rectangular top plate

Table 2

Dimensions in millimetres

Class	Top plate outer dimensions $l \times b$	Bolt hole spacing $d_l \times d_b$	Fixing bolt diameter D_{G1}
R51	160 × 120	105 × 80	10 12
R52	180 × 160	140 × 105	10 12 14 16
R53	230 × 180	160 × 120	12 14 16 20
R54	270 × 230	210 × 160	14 16 20

4.4 Offset

Table 3 specifies the minimum and maximum offset values (d_F) for swivel castors, corresponding to the wheel diameter (D), as in Figure 2.

For shock-absorbing castors, the offset may vary from the dimensions stated.

Table 3

Dimensions in millimetres

Wheel diameter D	**Offset** d_F	
	Minimum	Maximum
125	25	75
150/160	30	95
200	40	120
250	50	150
280/300	55	180
350/360	70	215
400	80	240
450	90	270
500	100	300

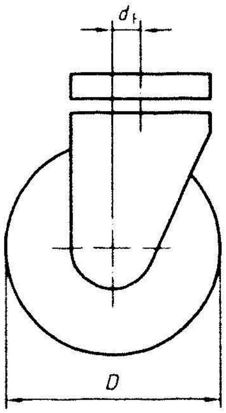


Figure 2 — Offset

4.5 Wheel

4.5.1 Characteristics

The characteristics of a wheel are

- diameter,
- hub width,
- bore diameter, and
- load capacity.

The characteristics of the wheel are illustrated in Figure 3 and the hub width (b_{T1}) and bore diameter (D_d) corresponding to each wheel diameter (D) are listed in Table 4. Wheels are not restricted to these hub widths and bores when used in castors.

The user shall verify the mechanical strength of axte components (bolts, nuts, bushes, spacers, etc.).

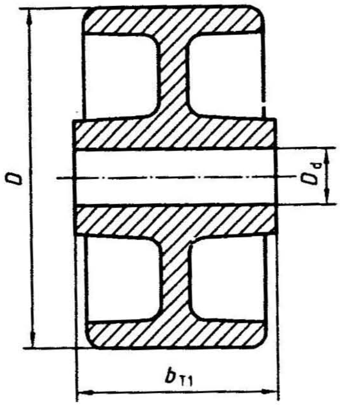


Figure 3 — Wheel dimensions

Table 4

Dimensions in millimetres

Wheel diameter	Hub width	Bore diameters[a]
D	b_{T1}	D_d
125	50	20
		25
	60	20
		25
150/160	60	20
		25
200	60	20
		25
	75	25
	90	25
		30
250	60	25
		30
	75	25
		30
	90	25
		30
	140	30
		40

Table 4 (*continued*)

Dimensions in millimetres

Wheel diameter D	Hub width b_{T1}	Bore diameters[a] D_d
280	60	25 30
	75	25 30
	90	25 30
300	90	25 30 35
	120	35 40
350/360	75	30 40
	90	35 40
400	75	30 35 40
	90	35 40
	120	40 50
	140	40 50
450	90	40 50
	120	60
500	90	40 50
	120	60
	160	60

[a] The above bores refer to the nominal diameter of the axle.

4.5.2 Wheel diameter tolerance

The tolerance on wheel diameter (D) shall be ±1,5 %.

4.5.3 Hub width tolerance

The tolerance on hub width (b_{T1}) shall be $^{0}_{-2\%}$.

4.6 Load capacity

This is the maximum load, in newtons, which can be carried by a wheel or a castor so as to fully comply with the required acceptance criteria.

5 Requirements for testing

5.1 General

Test apparatus and procedures shall be as specified in ?ISO 22878:-?. A static test is not required for this type of castor.

5.2 Standard conditions

5.2.1 Environmental conditions

Tests shall be carried out at a temperature between 15 °C and 28 °C. During the 24 h prior to the test, the samples shall remain at the specified temperature, in an environment with a relative humidity between 40 % and 70 %.

Samples shall not be artificially cooled during testing.

5.2.2 Test sequence

Tests, where applicable, shall be carried out in the sequence as listed in Table 5.

Table 5

Reference in this International Standard	Test sequence	Castors and wheel types	Test procedures given in ISO 22878:2004, subclause
5.3	Initial wheel play	All castors	4.2
5.4	Initial swivel play	Swivel castors with or without accessories	4.3
5.5	Electrical resistance	Castors and wheels electrically conductive or antistatic	4.4
5.6	Fatigue test for braking and/or locking device	Castors with — wheel locking/braking device — directional locking device — total locking/braking device — central locking/braking device If device is operated by means of threaded mechanism this test will not be applicable.	4.5
5.7	Efficiency check of wheel braking and/or locking device	Castors with — wheel locking/braking device — total locking/braking device — central locking/braking device	4.6
5.8	Efficiency check of swivel braking and/or locking device	Castors with — directional locking/braking device — total locking/braking device — central locking/braking device	4.7

Table 5 *(continued)*

Reference in this International Standard	Test sequence	Castors and wheel types	Test procedures given in ISO 22878:2004, subclause
5.9	Static test	This test is not required	4.9
5.10	Dynamic test	All castors	4.8
5.11	Efficiency check of wheel braking and/or locking device	Castors with — wheel locking/braking device — total locking/braking device — central locking/braking device	4.6
5.12	Efficiency check of swivel braking and/or locking device	Castors with — directional locking/braking device — total locking/braking device — central locking/braking device	4.7
5.13	Final wheel play	All castors	4.2
5.14	Final swivel play	Swivel castors with or without accessories	4.3

5.3 Initial wheel play

5.3.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.2.

5.3.2 Acceptance criteria

The measured initial wheel play shall not exceed the value d_{W1} given in Table 6.

Table 6

Symbol	Value	Description
D	variable	wheel diameter
d_{W1}	0,5 % of D	maximum initial wheel play

5.4 Initial swivel play

5.4.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.3.

5.4.2 Acceptance criteria

The measured initial swivel play shall not exceed the value d_{S1} given in Table 7.

Table 7

Symbol	Value	Description
d_{S1}	3 mm	maximum initial swivel play

5.5 Electrical resistance test

5.5.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.4.

5.5.2 Test values

The test values shall be as listed in Table 8.

Table 8

Symbol	Value	Description
F_{max}	variable	load capacity
F_{17}	10 % of F_{max}	test load
R	variable	electrical resistance

5.5.3 Tolerances

The tolerances shall be as shown in Table 9.

Table 9

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_{17}	N	$^{+2\%}_{0}$	N

5.5.4 Acceptance criteria

The resistance R of the sample tested shall be

- $R \leqslant 10^5\ \Omega$ for conductive castors or wheels, and
- $10^5\ \Omega < R \leqslant 10^7\ \Omega$ for antistatic castors or wheels.

5.6 Fatigue test for braking and/or locking device

5.6.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.5.

5.6.2 Test values

The test values shall be as listed in Table 10.

Table 10

Symbol	Value	Description
n_E	5 000	number of locking actions
f_E	10 cycles per min	frequency of locking actions
F_{max}	variable	load capacity
F_3	10 % of F_{max}	test load

5.6.3 Tolerances

The tolerances shall be as shown in Table 11.

Table 11

Symbol	Unit	Tolerance	
		Acceptable	Unit
n_E	—	$^{0}_{-1\,\%}$	—
f_E	cycles/min	$^{0}_{-2}$	cycles/min
F_3	N	$^{+2\,\%}_{0}$	N

5.6.4 Acceptance criteria

There shall be no wear and/or permanent deformation that adversely affects the performance of the sample.

5.7 Efficiency check of wheel braking and/or locking device

5.7.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.6.

5.7.2 Test values

The test values shall be as listed in Table 12.

Table 12

Symbol	Value	Description
F_{max}	variable	load capacity
F_{11}	equal to F_{max}	test load
F_{K1}	tread hardness $\geqslant$ 90 Shore A: 10 % of F_{max} tread hardness $<$ 90 Shore A: 15 % of F_{max}	horizontal tractive force

5.7.3 Tolerances

The tolerances shall be as shown in Table 13.

Table 13

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_{11}	N	$^{+2\,\%}_{0}$	N
F_{K1}	N	$^{+4\,\%}_{0}$	N

5.7.4 Acceptance criteria

There shall be no revolving movement around the wheel axis during the second application of the force F_{K1}.

5.8 Efficiency check of swivel braking and/or locking device

5.8.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.7.

5.8.2 Test values

The test values shall be as listed in Table 14.

Table 14

Symbol	Value	Description
F_{max}	variable	load capacity
F_{t1}	equal to F_{max}	test load
F_{K2}	tread hardness $\geqslant$ 90 Shore A: 10 % of F_{max} tread hardness $<$ 90 Shore A: 15 % of F_{max}	horizontal tractive force

5.8.3 Tolerances

The tolerances shall be as shown in Table 15.

Table 15

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_{t1}	N	${}^{+2\,\%}_{\;\;0}$	N
F_{K2}	N	${}^{+4\,\%}_{\;\;0}$	N

5.8.4 Acceptance criteria

There shall be no swivelling movement during the second application of the force F_{K2}.

5.9 Static test

This is not required.

5.10 Dynamic test

5.10.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.8.

5.10.2 Test values

The test values shall be as listed in Tables 16 and 17.

Table 16

Symbol	Value	Description
F_{max}	variable	load capacity[a]
v_1	see Table 17	average speed of running period
v_2	see Table 17	speed at impact with obstacles
h_1	height of obstacles for wheels with: tread hardness $\geqslant$ 90 Shore A: 2,5 % of D tread hardness $<$ 90 Shore A: 5,0 % of D	height of obstacles
d_c	see Table 17	distance between obstacles
n	5 times D, in mm	number of obstacles to be passed by the wheel
n_{r1}	not required in this test	number of wheel revolutions
t_{z1}	3 min	running period
t_{z2}	1 min	pause
D	variable	wheel diameter

[a] A simulated load applied mechanically, hydraulically or pneumatically is acceptable provided that it has been previously verified.

Table 17 — Test settings for speed categories

Category	A	B	C
Average speed of running period, m/s (km/h)	1,7 (6)	2,8 (10)	4,4 (16)
Speed of impact with the obstacles, m/s (km/h)	1,7 (6)	2,8 (10)	4,4 (16)
Minimum distance between obstacles, m	1	1,5	3

5.10.3 Tolerances

The tolerances shall be as shown in Table 18.

Table 18

Symbol	Unit	Tolerance	
		Acceptable	Unit
v_1	m/s	$^{+5\%}_{0}$	m/s
v_2	m/s	$^{+5\%}_{0}$	m/s
h_1	mm	$^{0}_{-5\%}$	mm
n	—	$^{+1\%}_{0}$	—
n_{r1}	—	$^{+1\%}_{0}$	—
t_{z1}	min	± 10	s
t_{z2}	min	± 10	s

5.10.4 Acceptance criteria

There shall be no permanent deformation of the sample that adversely affects its performance.

5.11 Efficiency check of wheel braking and/or locking device

Repeat test 5.7.

5.12 Efficiency check of swivel braking and/or locking device

Repeat test 5.8.

5.13 Final wheel play

5.13.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.2.

5.13.2 Acceptance criteria

The wheel wear play shall not exceed the value d_{W2} given in Table 19.

Table 19

Symbol	Value	Description
D	variable	wheel diameter
d_{W2}	0,5 % of D	maximum wheel wear play

5.14 Final swivel play

5.14.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.3.

5.14.2 Acceptance criteria

The swivel wear play shall not exceed the value d_{S2} as given in Table 20.

Table 20

Symbol	Value	Description
d_{S2}	3 mm	maximum swivel wear play

6 Conformity

On request, the manufacturer shall declare by a certificate of conformity that the castors or wheels are in accordance with the requirements as stated in this International Standard.

The type of test machine shall be stated in the conformity document.

7 Marking of the product

7.1 Product marking

All the products shall be permanently and visibly marked with a name and/or trademark of the manufacturer.

7.2 Marking of electrically conductive or antistatic castors or wheels

All products shall bear on their outer surface a clearly visible mark as follows:

- antistatic: a white mark and, where appropriate and possible, the word "antistatic";
- conductive: a yellow mark and, where appropriate and possible, the word "conductive".

Bibliography

[1] ISO 7619, *Rubber — Determination of indentation hardness by means of pocket hardness meters*

[2] ISO 22879, *Castors and wheels — Requirements for castors for furniture*

[3] ISO 22880, *Castors and wheels — Requirements for castors for swivel chairs*

[4] ISO 22881, *Castors and wheels — Requirements for use on manually propelled equipment for institutional applications*

[5] ISO 22882, *Castors and wheels — Requirements for castors for hospital beds*

[6] ISO 22883, *Castors and wheels — Requirements for applications up to 1,1 m/s (4 km/h)*

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